

110,214

PATENT



SPECIFICATION

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Complete Left, Apr. 10, 1917.

Complete Accepted, Oct. 18, 1917.

## PROVISIONAL SPECIFICATION.

## Improvements in or relating to a Process or Method of Uniting Similar or Dissimilar Metals or Alloys by Electric Welding.

I, HAROLD LANGTON TYSON WOLFE, M.I.E.E., Chief Electrical Engineer, East Indian Railway, Jamalpur, in the Monghyr District of Bengal, British India, do hereby declare the nature of this invention to be as follows:—

This invention relates to a process or method of uniting similar or dissimilar metals or alloys, particularly high speed tool steel or other hard metallic substances, to ordinary carbon steel by electric welding, and its object is primarily to prevent oxidation of the surfaces to be united by the rigid exclusion of air during the process of heating and welding; other objects being the provision of suitable means for carrying the said invention into effect and the production of a sound homogeneous weld.

As illustrative of one application of my said invention, I will proceed to describe it with reference to the electric welding of pieces of high speed tool steel to form the cutting edge or point, to shanks or bodies of ordinary carbon steel in the manufacture of drills and other cutters for machine tools such as drilling and boring machines, lathes, planing machines and the like. For the sake of brevity, the high speed tool steel pieces will be referred to as "the piece", and the shanks or bodies as "the body" in the following description.

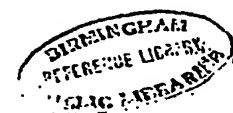
In or through a body of ordinary carbon steel, larger than the finished tool is required to be, a slot or recess is formed at or near to the end and, if the nature of the tool to be made so requires, eccentric to the longitudinal axis of the body. A piece of high speed tool steel is shaped to fit such slot or recess and to make a tolerably good fit therein.

The said piece being left of a sufficient length to protrude from both sides of the body in the case of a through slot, or from one side in the case of a recess, is driven in and the edges of the slot or recess where the piece emerges are contracted around it by caulking in order to embrace the piece tightly at those points and effect air-tight contact between the surfaces of the said piece and body.

The electric current for producing a welding heat in the tool under consideration is applied through massive contact blocks capable of being brought towards each other by hydraulic, mechanical or other suitable means, and exert a compressive force endwise on the piece seized between them. The electric current being thus applied, the end or ends of the piece protruding from the slot or recess in the body is or are made red-hot and plastic and, under the compressive force exerted thereon by the said contact blocks, is or are upset or spread beyond the caulked edges of the containing slot or recess.

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This upsetting or spreading of the protruding end or ends of the piece still further ensures the exclusion of air from the surfaces to be united.

This condition being obtained, the electric current is augmented until the temperature of the piece and body attains to that necessary for welding, the pressure of the contact blocks being maintained meanwhile.

The weld being effected, the superfluous metal of the body is removed by grinding or otherwise, and so as to expose a sufficient portion of the piece as may be required to form the desired cutting edge or point.

It is, in certain cases, advantageous to surround the piece with a thin envelope of copper or other metallic material previous to its insertion in the slot or recess provided for it in the body. The interposition of such a material has been found to facilitate the act of welding.

A further application of my said invention lies in the welding of such articles as the ends of a band saw. In such a case I contemplate the provision of a block of steel having a through slot adapted to receive the lapped or butted ends of the band saw to be united. The hereinbefore mentioned conditions as to the exclusion of air being satisfied by the tightly fitting in the block of the ends to be united, and the caulking of the edges of the slot around the band where it emerges therefrom, the electric current is applied through the block and welding effected, the block itself and any superfluous metal around the welded part being afterwards removed by grinding or otherwise.

Dated this 26th day of October, 1916.

J. S. WITHERS & SPOONER,  
Chartered Patent Agents,  
Staple House, 51 & 52, Chancery Lane, London,  
Agents for the Applicant.

### COMPLETE SPECIFICATION.

#### Improvements in or relating to a Process or Method of Uniting Similar or Dissimilar Metals or Alloys by Electric Welding.

I, HAROLD LANGTON TYSON WOLFE, M.I.E.E., Chief Electrical Engineer, East Indian Railway, Jamalpur, in the Monghyr District of Bengal, British India, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a process or method of uniting similar or dissimilar metals or alloys, particularly high speed tool steel or other hard metallic substances, to ordinary carbon steel by electric welding, and its object is primarily to prevent oxidation of the surfaces to be united by the rigid exclusion of air during the process of heating and welding; other objects being the provision of suitable means for carrying the said invention into effect and the production of a sound homogeneous weld.

As illustrative of one application of my said invention, I will proceed to describe it with reference to the electric welding of pieces of high speed tool steel, to form the cutting edge or point, to shanks or bodies of ordinary carbon steel in the manufacture of drills and other cutters for machine tools such as drilling and boring machines, lathes, planing machines and the like. For the sake of brevity, the high speed tool steel pieces will be referred to as the "piece", and the shanks or bodies as the "body" in the following description.

In the accompanying sheet of drawings are illustrated, for example, three

differing forms of lathe or planing tools and methods of applying thereto the pressure and electric current necessary for welding.

Figure 1 is a side sectional elevation of a tool in which the "piece" is inserted in a through slot in the "body" and parallel to its top and bottom sides.

Figure 2 is a view similar to Figure 1 but in which the "piece" is inserted in the "body" at an angle to the top and bottom sides.

Figure 3 is a plan view of a tool in which the "piece" is inserted in a recess formed in the end of the "body", and showing also a method of applying pressure and the electric current necessary to effect welding of the parts.

Figure 4 shows a plan of Figure 1 and also a method of applying pressure and the electric current.

Figure 5 is a view similar to Figure 4 but in which the "piece" projects from only one side of the "body".

In or through a "body" of ordinary carbon steel *a*, larger than the finished tool is required to be, a slot or recess is formed at or near to the end and, if the nature of the tool to be made so requires, eccentric to the longitudinal axis of the "body". A "piece" of high speed tool steel *b*, is shaped to fit such slot or recess and to make a tolerably good fit therein.

The said "piece", being left of a sufficient length to protrude from both sides of the body in the case of a through slot (as in Figures 1 and 4), or from one side only in the case of a recess (as in Figures 3 and 5), is driven in and the edges of the slot or recess where the "piece" emerges are contacted around it by caulking in order to embrace the "piece" tightly at those points and effect air-tight contact between the surfaces of the said "piece" and "body".

The electric current for producing a welding heat in the tool under consideration is applied through massive contact blocks *c* capable of being brought towards each other by hydraulic, mechanical or other suitable means, and also of exerting a compressive force endwise on the "piece" seized between them. The electric current being thus applied through the "piece" *b* the end or ends of the "piece" protruding from the slot or recess in the "body" is or are rendered red-hot and plastic.

Under the compressive force exerted thereon by the said contact blocks the said end or ends of the "piece" is or are upset or spread considerably beyond the caulked edges of the containing slot or recess as shown at *d*. This upsetting or spreading of the protruding end or ends of the "piece" still further ensures the exclusion of air from the surfaces to be united, and has the further consequence that the electric current enters at the "body" as well as at the "piece", and the proportions and the disposition of the contact blocks are chosen such wise that the greater part of the electric current now passes through the "body" rather than through the "piece", thus ensuring that the "piece" is not heated beyond the temperature requisite for producing the weld.

These conditions being satisfied, the electric current is augmented until the temperature of the "piece" and "body" attains to that necessary for welding, the pressure of the contact blocks being maintained meanwhile. The larger portion of the heating current being passed designedly through the "body", as previously explained, the latter attains to a higher temperature than the "piece", it not being desirable to heat the "piece" to any higher degree than is required to bring it just to the point of effecting the act of welding.

The weld being effected, the superfluous metal of the "body", bounded by the dotted lines and indicated by the letter *e* in Figures 1 and 2, is removed by grinding or otherwise, and so as to expose a sufficient portion of the "piece" as may be required to form the desired cutting edge or point.

It is, in certain cases, advantageous to surround the piece with a thin envelope of copper or other metallic material previous to its insertion in the slot or recess provided for it in the "body". The interposition of such a material has been found to facilitate the act of welding.

A further application of my said invention lies in the welding of such articles as the ends of a band saw. In such a case I contemplate the provision of a block of steel having a through slot adapted to receive the lapped or butted ends of the band saw to be united. The hereinbefore mentioned conditions as to the exclusion of air being satisfied by the tightly fitting in the block of the ends to be united, and the caulking of the edges of the slot around the band where it emerges therefrom, the electric current is applied in the manner aforesaid through the block and welding effected, the block itself and any superfluous metal around the welded part being afterwards removed by grinding or otherwise.

I am aware that it has heretofore been proposed in the manufacture of tools for cutting metals to construct the cutting portion or portions of high speed or other tool steel (tempered or temperable) and uniting or welding same to a body or bodies of different steel or iron by a welding material consisting of a metal (such as copper) of a lower fusible character than the metals forming the cutting portion or portions, and the remainder of the tool encasing the whole with a composition or paste made of ground coke, charcoal or other pure form of carbon, mixed with a binding material soluble in water, such as sugar, treacle and starch, and subjecting the mass to a heat sufficient to fuse the welding material.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. In the electric welding of similar or dissimilar metals or alloys in or to other such metals or alloys, the hereinbefore described method of excluding air from the surfaces to be united by caulking the edges of the slot or recess, in the "body" around an inserted "piece" where it emerges therefrom and subjecting the whole to gradually augmented pressure and electric heating current, the said current passing through the said "body", whereby the protruding end or ends of the inserted "piece" is or are upset or spread over or beyond the said caulked edges so as to further ensure exclusion of air, the electric current being then further augmented to bring the said surfaces to a welding heat.

2. A process of electric welding as set forth in Claim 1, characterised in that the inserted "piece" is completely enveloped in a thin sheet of copper or other suitable metallic substance.

3. A process of electric welding substantially as described and illustrated with reference to the accompanying drawing.

Dated this 10th day of April, 1917.

J. S. WITHERS & SPOONER,  
Chartered Patent Agents,  
Staple House, 51 & 52, Chancery Lane, London,  
Agents for the Applicant.

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[This Drawing is a reproduction of the Original on a reduced scale.]

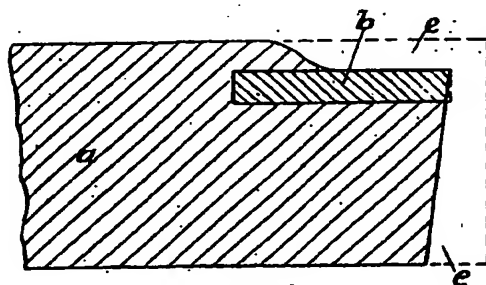


Fig 1

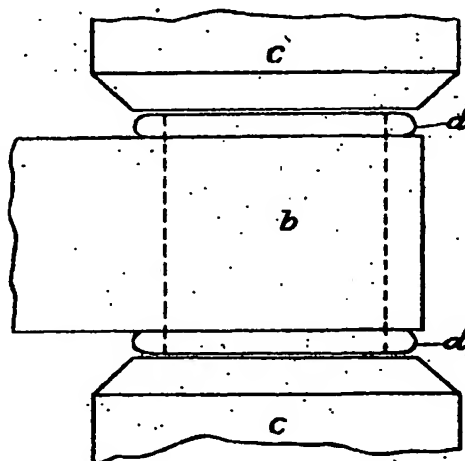


Fig 4

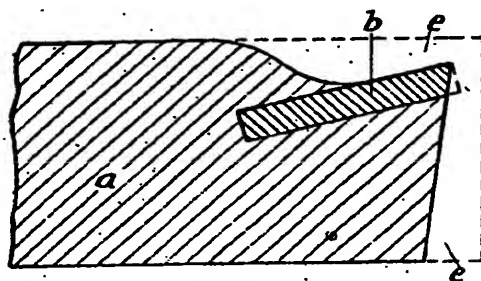


Fig 2

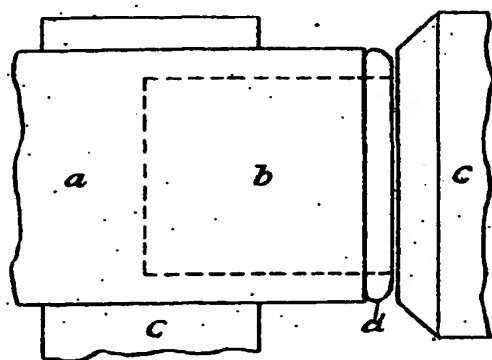


Fig 3

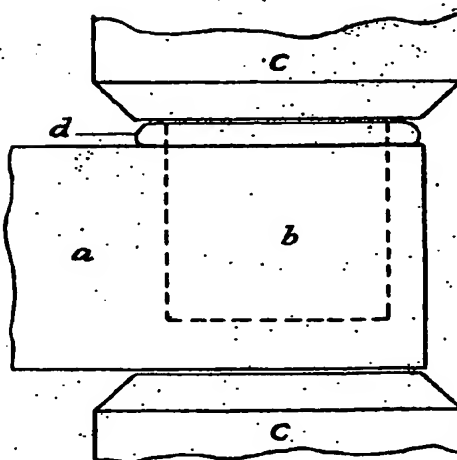


Fig 5

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